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PANDEA CYBELES, A NEW MEDUSA FROM THE SARGASSO SEA (COELENTERATA: ANTHOMEDUSAE: PANDEIDAE)

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Abstract.—A new medusa is described and illustrated. It is compared to related species in the genus, *Pandea conica* (Quoy & Gaimard, 1827) and *Pandea rubra* Bigelow, 1913. It differs from those species in the proportions of the umbrella and its conical process, number of ribs on the umbrella, number of marginal tentacles, ocelli on the basal bulb of tentacles, and the large size of the stomach. The diagnostic characteristics of these species and *Pandea cybeles* are compiled in a table. Information is included on the distribution of the species throughout the world.

The genus *Pandea* Lesson, 1843, includes two valid species, *Pandea conica* (Quoy & Gaimard, 1827) and *Pandea rubra* (Bigelow, 1913. Mayer (1910) recognized five species of Pandeidae: *Pandea conica* (Quoy & Gaimard, 1827), *P. saltoria* (Sars, 1835), *P. minima* von Lendenfeld, 1884, *P. violacea* Agassiz & Mayer, 1899, and *P. maasi* Maas, 1904.

According to Kramp (1965) *P. maasi* is a synonym of *Euphysa flammea* (Linko, 1905); *P. minima* and *P. violacea* are juvenile stages of indeterminable Tiaridae, placing also *P. violacea* under *Merga violacea* (Agassiz & Mayer, 1899); and *P. saltoria* is a species of *Aglantha.*

During the Sargasso Sea Biowat cruise on the R/V *Knorr* in Apr 1975, plankton collections were obtained, and some specimens of Medusae, Siphonophora, and Ctenophora were kindly sent to me by Michael Latz (Department of Biological Sciences, University of California, Santa Barbara) for identification. The medusae included three specimens of a new species of *Pandea,* described below.

Pandea cybeles, new species
Figs. 1, 2

Material.—NE Sargasso Sea, Biowat Cruise of R/V *Knorr,* Apr 1975, from tows with Tucker ½ m net with 333 μm mesh: Sta 240, 34°53.22′N, 70°06.01′W, ca. 100 m depth, 20 Apr 1975, holotype, USNM 77473.—Sta 231, 33°55.74′N, 69°59.11′W, ca. 1 m depth, 19 Apr 1975, paratype, USNM 77474. A third specimen from Sta 230, 33°55.74′N, 69°59.11′W, ca. 1 m depth, 19 Apr 1975, was left at the University of California, Santa Barbara.

Description.—Umbrella bell-shaped, slightly higher than wide (heights 18, 20 and 25 mm, widths 14.5, 16.3 and 20 mm respectively), with conical apical process about 5 mm long (measurements included in total height) in largest medusa (Fig. 1). Exumbrella with ridges reaching from tip of apical process to each marginal tentacle, alternating with grooves running from tip of apical process to spaces between tentacles at edge of umbrella. Crest of each ridge with thin whitish band, probably formed by rows of nematocysts. The four wide radial canals with rough margins. Circular or ring canal simple, about half width of radial canals, with smooth margins (Fig. 1). Centripetal canals lacking. Velum narrow.

Marginal tentacles about 40, 10 at each space between perradii, long, of same size, hollow. Base of tentacle with thick conical laterally compressed bulb or spur clasping margin of umbrella. Abaxial spur of each tentacle having 1 red ocellus.

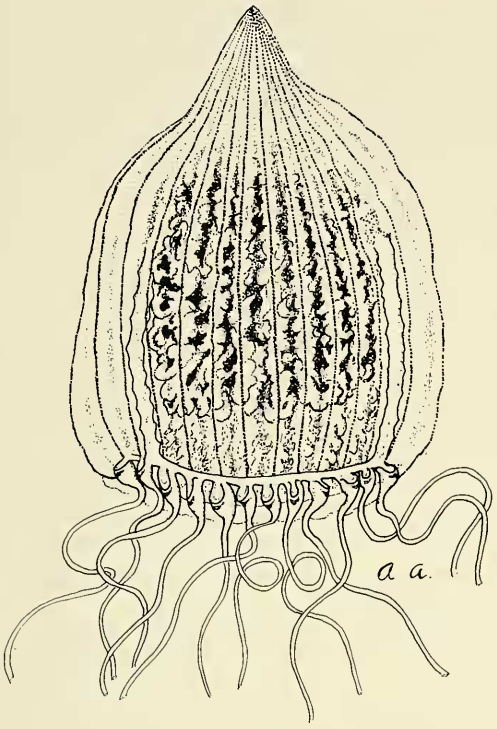

Fig. 1. *Pandea cybeles,* habitus.

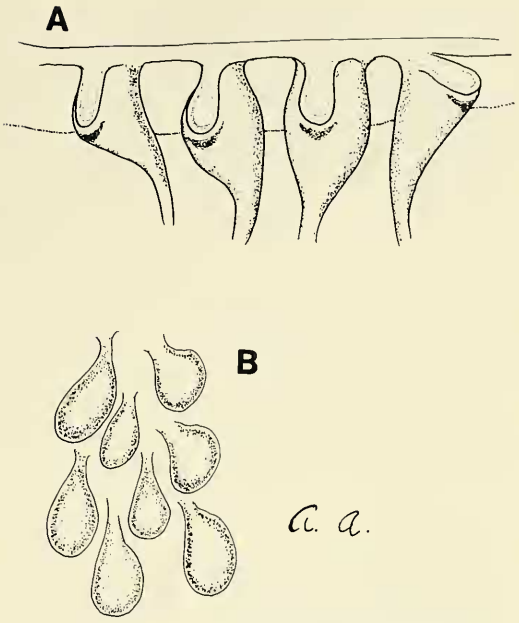

Fig. 2. *Pandea cybeles:* A, Detail of bulbs in marginal tentacles; B, Detail of internal ovular formations in gonads.

Stomach large, completely filling subumbrellar cavity, attached for about ⅓ of its length to subumbrella perradii.

Mouth with 4 perradial lips deeply and complexly folded, with crenulated edges, reaching border of umbrella.

Gonads extending over interradial and perradial zones, completely covering stomach, forming irregular network of sinuous ridges and pits, latter corresponding to internal ovular formations (Fig. 2B).

Color of stomach, mouth, gonads, and border of umbrella pinkish, with light purple and violet tones. Thick jelly umbrella and conical apical process, crystal clear with violet tones, revealing darker tones of stomach and gonads within.

Etymology.—Named after Cybele, goddess of nature.

Remarks.—Differential morphological characteristics of *Pandea cybeles, P. conica,* and *P. rubra* are given in Table 1.

Pandea cybeles differs from *P. conica* in the proportion of length to width of the umbrella, the number of ribs, the number of marginal tentacles, and the size of the stomach.

Pandea cybeles differs from *P. rubra* in having a conical apical process of the umbrella, and ribs and nematocyst tracks on the umbrella, all of which structures are absent in *P. rubra.* The circular canal is broader in *P. rubra* than in *P. cybeles.* The number of marginal tentacles is different in the two species, and *P. rubra* does not have ocelli on the basal bulb of the tentacles.

The stomach of *P. rubra* reaches to half the length of the subumbrellar cavity; in *P. conica* it occupies about ⅓ or ½ of the length of the subumbrellar cavity, whereas in *P. cybeles* it fills completely the subumbrellar cavity, reaching the margins of the umbrella.

Differences between *Pandea rubra* and *Pandea cybeles* are obvious and do not require further discussion. However, *Pandea*

Table 1.—Principal differential characteristics of the species of *Pandea* and the new species.

Characteristics	*Pandea conica* (Quoy & Gaimard, 1827)	*Pandea rubra* Bigelow, 1913	*Pandea cybeles*, n. sp.
Umbrella	Bell barrel-shaped, about twice as high as wide, jelly fairly thick, with apical process	Bell-shaped, as high or slightly higher than wide, with rounded summit, without apical process. Thin soft walls	Bell-shaped, slightly higher than wide, of thick jelly, with thick apical conical process
Umbrella size	20–30 mm height, 10–15 mm wide	30–40 mm height up to 75 mm	18–25 mm height and 14.5–20 mm wide
Velum	Narrow	Narrow	Narrow
Apical conical process	Conical at summit, with apical ectodermal thickening	Not present	Present, long conical ectodermal thickening at top of umbrella
Ribs and ridges	16 or in the 20's. Exumbrellar nematocyst ribs	No ribs or exumbrellar nematocyst tracks	Present 40 exumbrellar ribs with nematocyst band at crest edge, extending from tip of conical process to edge of umbrella
Radial canals	4 broad, smooth or jagged	4 broad with wavy or jagged outlines	4 broad with jagged outline
Circular canal	Narrower than radial canals, smooth outlines	Broad, with smooth outlines	Narrower than radial canals, about half width, smooth outlines
Marginal tentacles	16 or in the 20's, smooth, hollow, with conical laterally compressed basal bulb, without well developed abaxial spur, with one abaxial ocellus. No rudimentary marginal tentacles	18–24 of various sizes, hollow, smooth, with large conical basal bulb, not laterally compressed, with distinct abaxial spur clasping margin of umbrella. No ocelli. No rudimentary marginal tentacles	About 40, 10 from perradial to perradial, hollow, long, with conical laterally compressed basal bulb, with abaxial spur and ocellus. No rudimentary marginal tentacles
Stomach	Large, pyramidal, almost filling upper ⅓ of subumbrellar cavity, attached about ⅘ of length to subumbrellar perradii	Large, with broad base, about half-height of subumbrellar cavity, attached to subumbrellar perradii for about ⅘ of its length	Large, filling completely subumbrellar cavity, attached ⅓ of its length to subumbrellar perradii
Mouth	4 perradial lips with folded crenulate edges	4 lips with folded crenulate margins	4 perradial lips with complexly folded crenulate edges reaching border of umbrella
Gonads	On entire interradial walls of stomach, forming coarse meshwork of ridges and pits, surrounding the stomach	Very fine meshwork of pits, interradially on stomach, close-meshed irregular network of ridges with pits between them	Extended over interradial and perradial zones covering completely stomach, forming network of ridges and oval pits

Table 1.—Continued.

Characteristics	*Pandea conica* (Quoy & Gaimard, 1827)	*Pandea rubra* Bigelow, 1913	*Pandea cybeles*, n. sp.
Color	Stomach and gonads reddish, brownish or yellowish. Mouth lips reddish or pink, tentacles milky yellow, ocelli red or reddish brown. Subumbrella colorless	Subumbrella, stomach, mouth, gonads and marginal tentacles deep brownish red or chocolate	Stomach, mouth, gonads and border of umbrella pink with light purple and violet tones
Distribution	Atlantic, Mediterranean	Bermuda, NW Pacific, Bering Sea, British Columbia. Probably inhabiting deep waters	Sargasso Sea

conica and *Pandea cybeles* are more closely related, as both have a long conical process at the top of the umbrella. Therefore, a discussion on the descriptions of *Pandea conica* published by various authors will enlighten the separation of the species.

There is some disagreement among the various authors on the number of marginal tentacles, as well as in the proportion of height and width of the umbrella. It appears in some instances that authors were including under *Pandea conica* specimens belonging to different species.

However, all authors basically agree, when defining *Pandea conica,* that the height of the umbrella is about twice its width, the manubrium extends only along the upper ⅓ or half of the subumbrellar cavity, and the number of ribs on exumbrella and marginal tentacles is in the 20's, about 24.

A chronological review of descriptions by various authors follows.

Quoy & Gaimard (1827) first described the medusa as *Dianaea conica,* collected near the Strait of Gibraltar, as body elongated conically pointed at the top, "tentacles small, filamentous, in the 20's, with reddish spot at their base. The umbrella presented as many striae as tentacles. Manubrium with 4 small short arms, pink in color, the rest of the medusa transparent." Their illustration of the medusa shows size proportions of umbrella, stomach and tentacles.

Maas (1904) found abundant specimens of *Pandea conica* at Monaco Bay, and those had 8, 16, or 20 tentacles.

Mayer (1910) described *Pandea conica* as "barrel-shape sides bluntly pointed, 21 mm high and 10 mm wide, with 8 to 24 well developed longitudinal rib-like ridges along exumbrella and equal number of marginal tentacles with abaxial ectodermal ocelli. Stomach wide and short with 4 folded lips having sinuous margins." The colors of gonads, tentacles, and ocelli were brownish red, yellowish-milky and dark purple, respectively. Mayer's illustration (1910:117) shows short additional ridges extending up to ⅓ from the border of the umbrella, and the conical top is missing. Either this is an illustration of a newly-born medusa or it is not *P. conica.*

Vanhöffen (1911) indicated *P. conica* 12.5 mm high and 10 mm wide with conical process of 2 mm, 4 radial canals and ring canal. The largest specimens had 19 or 20 tentacles. Other characteristics agreed with descriptions by other authors.

Hartlaub (1913) also indicated the umbrella extending into a conical process at the top, being 21 mm high and 10 mm wide, with 24 marginal tentacles, and the stomach

extending along the upper ⅓ of the subumbrellar cavity. Gonads and color agree with previous descriptions. Figure 286 on page 339 of Hartlaub 1913 illustrates his description.

Browne (1916) referred to *Pandea* juvenile specimens obtained at the Chagos Archipelago, which could be related to *Pandea conica.* The smallest was about 2.5 mm in diameter.

Uchida (1927) discussed the characteristics of *Pandea conica* and *P. rubra.* He identified and described specimens obtained at Misaki, Japan, as *Pandea conica,* with "bell somewhat prismatic, with truncated top, 30 mm high and 17 mm wide; exumbrella with 44 longitudinal ridges. 4 Radial canals, wide, jagged, widest in the lower half. Ring canal narrower. Tentacles 44, all of similar length, hollow. Manubrium wide and short, nearly filling the upper half of bell cavity, fused with the upper part of subumbrella." The rest of the descriptive part agrees with other authors, in gonads, color, etc. He explained, "Ocellus could not be found in preserved specimens."

The truncate top of the umbrella of Uchida's specimens indicates that those specimens apparently do not belong to *Pandea conica* (see fig. 38, page 214 of Uchida 1927).

Ranson (1936) discussed the characteristics of species of *Pandea,* mainly referring to *P. conica* and *P. rubra.* The collections Ranson analyzed included abundant specimens or various sizes, enabling him to determine series of development of the medusa. A table on page 83 compiles the characteristics of *P. conica* as described by various authors. Analysis of data in that table suggests that under *P. conica* were included some specimens belonging to other species.

Russell (1953) described *P. conica* with higher than wide umbrella, conical summit, 16 to 24 longitudinal exumbrellar nematocyst ribs and corresponding number of marginal tentacles; jelly fairly thick. Velum narrow. Stomach pyramidal filling upper half of subumbrellar cavity, etc.

Kramp (1961) described *P. conica* "up to 21 mm high, 10 mm wide, with a conical apex terminating with a peculiar patch of thickened ectoderm; exumbrella with longitudinal ribs and ridges. Manubrium about half as long as bell cavity, with short mouth tube and folded lips. Radial canals fairly narrow, smooth. 16–24 tentacles with laterally compressed basal bulbs, with abaxial ocellus."

Radial canals in *P. conica* as described by Kramp (1961) do not agree with those in *P. cybeles,* which are wide with jagged outlines.

According to Kramp (1961) the *Pandea conica* of Bigelow (1918) found between Chesapeake Bay and Bermuda is possibly a new species.

The main anatomical features used to distinguish species of *Pandea* are: shape, dimensions, and characteristics of umbrella; shape and dimensions of stomach; characteristics of canals; number and characteristics of tentacles.

In *Pandea conica* according to most authors, the height of the umbrella is almost twice its width. The stomach occupies the upper ⅓ or probably half of the subumbrellar cavity. Ribs and tentacles are in the 20's, usually up to 24.

In *Pandea cybeles,* width and height of umbrella are rather similar, only slightly higher than wide. The stomach is large, filling completely the subumbrellar cavity, extending to the edge of the umbrella. Ribs and marginal tentacles number 40.

Differences between *P. conica* and *P. cybeles* are clear when comparing the illustrations by Quoy & Gaimard (1827), Hartlaub (1913), Russell (1953), and Kramp (1959, 1965), with those of *P. cybeles* in the present work.

Distribution.—The medusa is a meroplanktonic stage. Specimens of *Pandea,* including *Pandea cybeles* have been mainly obtained far offshore at oceanic localities.

Therefore, the medusae experience wide oceanic distribution, enjoying a long-lived pelagic medusoid stage. Kramp (1959) stated that the large size of the medusae may indicate a long pelagic life, which is advantageous for increasing dispersion of the population, with the opportunity to be transported by currents to regions distant from the normal habitat of the species. Kramp (1959) also suggested that in *Pandea conica,* wide oceanic distribution is due to the fact that its hydroid is attached to the shell of the pteropod *Cleodora cuspidata.*

Segura (1984) found specimens of *Pandea* sp. at several locations northwest of the Galapagos Islands, off Ecuador and Peru. They were juvenile specimens of some species of *Pandea,* with umbrella 1.0 to 3.0 mm high and 1.0 to 2.0 mm wide, with no apical projection, umbrella of thick mesoglea, exumbrella with longitudinal rows of nematocyst tracks in same number as marginal tentacles. Velum narrow. Stomach large, filling almost completely the subumbrellar cavity. Radial canals wide, circular canal narrow. Marginal tentacles up to 24, tentacular basal bulbs conical, laterally compressed. No ocelli at basal bulb of tentacles.

Pandea conica has been observed near Bermuda (Bigelow 1918, 1938), China (Chiu 1954), Gibraltar (Hartlaub 1913), Tristan de Cunha (Haeckel 1879), Alboran Sea, Tirrhenian Sea, Sidra Sea, Messina, Aegean Sea, Marmora Sea, Strait of Gibraltar (Kramp 1924), Japan and Philippine Islands (Kramp 1928), Gulf of Guinea (Kramp 1955), West Africa and off Argentina (Kramp 1957), Sargasso Sea, west of Spain, east of Azores (Kramp 1959), East Africa, Ceylon, East Australia, New Zealand, Vietnam (Kramp 1968), Strait of Gibraltar (Quoy & Gaimard 1827), Mediterranean Sea (Ranson 1936), Japan (Uchida 1927), Agulhas Current (Vanhöffen 1911), China Seas (Zhang 1979).

Pandea rubra has been recorded from British Columbia and Puget Sound (Arai & Brinckmann-Voss 1980), Gulf of Alaska, Aleutians, Southeast Kamchatka, Sea of Okhotsk, San Francisco (Bigelow 1913), Bermuda (Bigelow 1938), West Ireland (Kramp 1920), west of British Isles (Kramp 1929, Russell 1953), south and southwest of Iceland (Kramp 1926), South Africa, Weddell Sea, Antarctic (Kramp 1957a, b), Northwest Pacific, Ceylon, Northeast Pacific (Kramp 1965), USSR Far East waters (Naumov 1956), Cochin, Malabar-Trivandrum coastal waters (Vannucci et al.1970).

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